

MARKED UP VERSION OF AMENDED SPECIFICATION AND CLAIMS

IN THE SPECIFICATION

Please replace the paragraph beginning at page 2, line 10 as follows:

In light of these and other drawbacks, the present invention provides a motor coil-shortening detecting unit that includes a motor having a wire wrapped about its rotor, a detecting means for detecting current or voltage supplied to the motor from a power source, and a determining means that determines a coil short. In the motor, external electric power is supplied to the rotor, for rotation thereof, through a commutator provided on the rotor and a brush that slides over the commutator. The determining means determines shorting by comparing the detected current or voltage with a pre-stored current or voltage supplied from the power source. As such, the detecting means detects the current or the voltage supplied to the motor from the power source, and the determining means determines a short of at least one of the coils by comparing the detected voltage or current and the pre-stored voltage or current supplied from the power source during normal operation. Therefore, one detecting means is provided. Furthermore, since shorting is determined based on the current or

voltage varied due to motor rotation, shorting is determined irrespective of motor load.

Please replace the paragraph beginning at page 3, line 12 as follows:

In another aspect, the determining means includes a temperature correction circuit for correcting any pre-stored reference current value or voltage value supplied from the power source during normal operation according to a circumferential temperature. Therefore, the determining means includes the temperature correction circuit for correcting the pre-stored current or voltage reference supplied from the power source during normal operation. According to another aspect, the stop control means stops power supply for the motor when the determining means determines that one of the coils has shorted.

Please replace the paragraph beginning at page 3, line 23 as follows:

In another aspect, an abnormality informing means is provided for informing a user of motor abnormality when the coil shorting is determined by the determining means. Therefore, the abnormality informing means informs a user of motor abnormality when it is determined by the determining means that at least one of the coils has shorted. A stop control means for stopping power supply

for the motor when the coil shorting is determined by the determining means is provided.

Please replace the paragraph beginning at page 5, line 26 as follows:

Detection signals from the current sensor 13, based on values of current supplied to the motor 1 (anode brush 5a) by the driving circuit 11, are input to controller 14. The controller 14 determines whether or not any of the coils 3a - 31 has shorted based on the input detection signals.

Please replace the paragraph beginning at page 6, line 4 as follows:

Here, FIG. 3A shows variations (ripple) of the current supplied to the motor 1 when the motor 1 rotates when all of the coils 3a - 31 are normal (the coils 3a - 31 are not shorted). In the same drawing, an average current variation (in the present embodiment, an average variation of a ripple which is a minimum current value out of a max current value per unit rotation) is indicated by "I1". On the other hand, FIG. 3B shows the variations of the current when the motor 1 rotates when at least one of the coils 3a - 31 is shorted. In the same drawing, the average current variation is indicated by "I2" which is larger than "I1". The reason is that current routes are changed between the

original case (normal case) and when at least one of the
coils 3a - 3l [are] is shorted.

Please replace the paragraph beginning at page 7, line 5 as follows:

When the average current variation supplied to the motor 1 becomes less than a lower limit determination value, set slightly less than the first reference value "I1", motor 1 is determined to be under a rotation constraint condition due to its load. FIG. 4A shows a current value during the motor rotation constraint due to its load in the normal case (when coils 3a - 3l are not shorted). In the same drawing, the current value is indicated by "I3". On the other hand, FIG. 4B shows a current value during the motor rotation constraint due to its load during shorting of at least one of the coils 3a - 3l. In the same drawing, the current value is indicated by "I4" which smaller than normal. The reason is also that current routes are changed between the original case (normal case) and when at least one of the [shorting of] coils 3a - 3l is shorted.

Please replace the paragraph beginning at page 7, line 19 as follows:

In the controller, the current value "I3" during a normal state is stored as a second reference value. When

current variation is lower than the lower limit value and becomes less than a determination value, set slightly less than a second reference value "I3", at least one of the coils 3a - 31 is determined to be shorted. The stored second reference value "I3" is corrected according to a circumferential temperature by the temperature correction circuit 14a provided in the controller 14, thereby reducing adverse effects for determination due to the circumferential temperature variations. When the controller 14 determines that at least one of the coils 3a - 31 [are] is shorted in this manner, the controller 14 stops power supply to motor 1 from driving circuit 11, and turns on a warning lamp 15.

Please replace the paragraph beginning at page 8, line 6 as follows:

(1) The current sensor 13 detects the value of the current supplied to the motor 1 from the power source, and the controller 14 determines a short of at least one of the coils 3a - 31 by comparing the detection result from the current sensor 13 and the pre-stored current value supplied from the power source.

Please replace the paragraph beginning at page 8, line 22 as follows:

(4) In the present embodiment, the warning lamp 15, which informs a user that the motor 1 is malfunctioning when the controller 14 determines that at least one of the coils 3a - 3l has shorted, is provided.

Please replace the paragraph beginning at page 9, line 24 as follows:

In the above embodiment, when the controller 14 determines that the at least one of the coils 3a - 3l [have] has shorted, the controller 14 stops power supply for the motor 1. However, the controller 14 does not need to stop power supply. In the above embodiment, the warning lamp 15, which informs a user of motor 1 malfunction when one of the coils 3a - 3l [are] is shorting, is provided. However, sounds from a buzzer or the like other than the lamp 15 can be used.

IN THE CLAIMS

1. (Amended) A motor coil-shortening detecting unit, comprising:

a motor including a rotor having a wire with a plurality of coils wrapped around said [motor]rotor;

a commutator provided on the rotor;

a brush that slides over the commutator, electric power being supplied to the rotor from an external power source via the commutator and brush to rotate the rotor;

a detecting means that detects a current or a voltage supplied to the motor from a power source;

a determining means that determines an occurrence of a short of at least one of the plurality of the motor coils by [comparing] determining that the detected voltage or current obtained by the detecting means exhibits a larger fluctuation range than the respective pre-stored voltage or current, [with a respective pre-stored voltage or current,] said pre-stored voltage or current representative of that supplied from the external power source during a normal state.

2. (Amended) The motor coil-shortening detecting unit according to claim 1, wherein:

the determining means [makes] determines the short based on ripple variations of the current or voltage supplied to the motor from the external power source, the ripple variations being detected by the detecting means.

4. (Amended) The motor coil-shortening detecting unit according to [any one of]claim[s 1 -] 3, further comprising:

an abnormality informing means for informing a user when the short is determined by the determining means.

5. (Amended) The motor coil-shortening detecting unit according to [any one of]claim[s 1 -] 4, further comprising:

a stop control means for stopping power supply to the motor when the short is determined by the determining means.

6. (Amended) A motor coil-shortening detecting unit, comprising:

a motor including a plurality of coils;

a commutator provided on the rotor that electrically communicates with the coils;

a brush that slides over the commutator, electric power being supplied from an external power source to the coils via the commutator and brush to rotate the rotor;

a current detector that detects a current supplied to the coils from the power source;

a [determing] determining device that compares the detected current with a pre-stored current, said pre-stored current representative of a current supplied by said power source and used by said motor when [no] a short does not exist[s];

an indication device responsive to said determining device that indicates [when] said short exists when the detected current exhibits a larger fluctuation range than the respective pre-stored current.

8. (New) A motor-coil short detecting apparatus comprising:

a motor including a rotor having a wire with a plurality of coils wrapped around said rotor;

a commutator provided on the rotor;

a brush that slides over the commutator, electric power being supplied to the rotor from an external power source via the commutator and the brush to rotate the rotor;

a detecting means that detects a current or a voltage supplied to the motor from a power source;

a determining means that compares the detected voltage or current obtained by the detecting means with a respective pre-stored voltage or current to determine

whether a short has occurred in one of the plurality of coils, said pre-stored voltage or current representative of that supplied from the external power source during a normal state;

an abnormality informing means for informing a user when the determining means has determined that the short has occurred;

a stop control means for stopping power supply to the motor when the determining means has determined that the short has occurred, wherein

the stop control means is invoked when the determining means determines that the short has occurred based on a variation of the current supplied to the motor when a current fluctuation range experienced in a single rotation of the rotor is different than a current fluctuation range of a prior single rotation of the rotor.

9. (New) The motor-coil short detecting apparatus of claim 8, wherein the determining means determines that the short has occurred when a current route changes among the coils.

10. (New) A motor coil-shortening detecting unit, comprising:

APPENDIX

a motor including a rotor having a wire with a plurality of coils wrapped around said rotor;

a commutator provided on the rotor;

a brush that slides over the commutator, electric power being supplied to the rotor from an external power source via the commutator and brush to rotate the rotor;

a detecting means that detects a current or a voltage supplied to the motor from a power source;

a determining means that determines an occurrence of a short of at least one of the plurality of the motor coils by determining that the detected voltage or current obtained by the detecting means exhibits a larger fluctuation range than the respective pre-stored voltage or current, said pre-stored voltage or current representative of that supplied from the external power source during a normal state, wherein

the determining means determines the short based on ripple variations of the current or voltage supplied to the motor from the external power source, the ripple variations being detected by the detecting means,

the determining means includes a temperature correction circuit for correcting the pre-stored current or voltage according to a circumferential temperature;

an abnormality informing means for informing a user when the short is determined by the determining means; and

a stop control means for stopping power supply to the motor when the short is determined by the determining means.